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**REMARKS****Status of Claims**

As of this amendment, Claims 1, 5-10, 14-19, 22-31, 34-40 and 43-50 are pending in the instant application, and of these, Claims 1 and 19 are currently being amended.

The amendments to claims 1 and 19 are fully supported by the Specification, Claims as originally filed, and Drawings. No new matter is being added. For example, the amendments to claims 1 and 19 are supported by paragraph 16 and 17 of the Specification. Entry of the amendments is respectfully requested.

**Allowed Claims**

Applicant thanks the Examiner for indicating allowance of Claims 10, 14-18, 23-31, 34-38, 40 and 43-50.

**Objection to Claim 44**

The Examiner objected to Claim 44 because the phrase "comprising consisting," on line 8, should read "consisting". However, this claim was amended in the amendment filed on December 18, 2003 to delete the word "comprising" on line 8. Thus, this objection is believed to be obviated.

**Rejection of Claim 19 under 35 USC 102(b)**

The Examiner rejected Claim 19 under 35 USC 102(b) as being anticipated by U.S. Patent No. 5,942,834 to Davis.

Claim 19 is not anticipated by Davis because Davis does not teach a method of generating electrons comprising, inter alia, "(a) negatively biasing the cathode relative to the anode to generate a localized electric field at the tapered tip of the electron emitting portion of the cathode; and (b) heating the cathode by directing an electromagnetic radiation beam onto the substantially concave or substantially conical surface of the beam

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receiving portion of the cathode" as recited in the claim as amended.

Instead, Davis discloses heating a cathode in a thermionic electric converter in which, in one version, the cathode may be curved and the heat source may be a laser. This is not the same as the method of generating electrons of Claim 19, in which the cathode comprising an electron emitting portion having a tapered tip is negatively biased relative to the anode to generate a localized electric field at the tapered tip. Davis does not teach negatively biasing a cathode comprising an electron emitting portion having a tapered tip. Davis also does not teach biasing the cathode to generate a localized electric field at the tapered tip. Thus, Claim 19, and those claims dependent therefrom, are not anticipated by Davis.

**Rejection of Claims 1, 5, 7 and 39 under 35 USC 103(a)**

The Examiner rejected Claims 1, 5, 7 and 39 under 35 USC 103(a) as being unpatentable over Davis in view of Japanese Publication No. 06-181029 to Matsumoto et al.

**Claim 1**

Claim 1 is patentable over Davis in view of Matsumoto et al. because neither of these references teaches an electron source comprising, inter alia, "an anode; a cathode comprising a beam-receiving portion and an electron emitting portion, the beam-receiving portion having a substantially concave or substantially conical surface, the electron emitting portion having a tapered tip; an electromagnetic radiation source adapted to generate an electromagnetic radiation beam to heat the cathode; and a lens adapted to direct the electromagnetic radiation beam onto the substantially concave or substantially conical surface of the beam-receiving portion of the cathode" as recited in the claim as amended.

Instead, Davis discloses a thermionic electric converter having a cathode off which electrons are boiled and a heat source to heat the cathode. In one version, the cathode has a parabolic surface, and in other versions, "other curved surfaces may be

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used" (column 8, line 38). Also, In one version, the heat source may be a laser. However, this is not the same as the electron source of Claim 1 which has a cathode comprising a beam receiving portion having a substantially concave or conical surface and an electron emitting portion having a tapered tip. Davis does not disclose a cathode comprising a beam receiving portion and an electron emitting portion, the beam receiving portion having a substantially concave or conical surface and the electron emitting portion having a tapered tip.

Matsumoto et al. does not make up for the deficiencies of Davis. Instead, Matsumoto et al. discloses an electron gun comprising a cathode and a waveguide to guide a laser onto the cathode to heat the cathode. However, this is also not the same as the electron source of Claim 1. Matsumoto et al. does not disclose a cathode comprising a beam receiving portion and an electron emitting portion, the beam receiving portion having a substantially concave or conical surface and the electron emitting portion having a tapered tip.

Thus, Davis and Matsumoto et al. do not teach all the limitations of Claim 1. Furthermore, it would not be obvious to arrive at the cathode of claim 1 from these references. Davis and Matsumoto et al. do not teach or provide motivation for having a cathode comprising a beam receiving portion having a substantially concave or conical surface and an electron emitting portion having a tapered tip. Furthermore, Davis teaches away from a cathode having an electron emitting portion comprising a tapered tip by disclosing "the cathode 220 of the present invention is specifically designed to improve efficiency by increasing the electron emission area of the cathode" (column 7, lines 47-50). The tapered tip of the electron emitting portion of the cathode of Claim 1 does not increase the electron emission area, and, compared to the cathode embodiments discussed by Davis, may represent a decreased electron emission area. Matsumoto et al. also does not teach or provide motivation for a cathode comprising a beam receiving portion having a substantially concave or conical surface and an electron emitting portion having a tapered tip.

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Thus, Claim 1, and those claims dependent therefrom, are patentable over Davis in view of Matsumoto et al.

**Rejection of Claim 9 under 35 USC 103(a)**

The Examiner rejected Claim 9 under 35 USC 103(a) as being unpatentable over Davis in view of Matsumoto et al. and further in view of Japanese Publication No. 5-159694 to Nayama et al.

**Claim 1**

Claim 1 is patentable over Davis in view of Matsumoto et al. and further in view of Nayama et al. because none of these references teaches, inter alia, "an anode; a cathode comprising a beam-receiving portion and an electron emitting portion, the beam-receiving portion having a substantially concave or substantially conical surface, the electron emitting portion having a tapered tip; an electromagnetic radiation source adapted to generate an electromagnetic radiation beam to heat the cathode; and a lens adapted to direct the electromagnetic radiation beam onto the substantially concave or substantially conical surface of the beam-receiving portion of the cathode" as recited in the claim as amended.

As discussed above, Davis and Matsumoto et al. do not teach, disclose or provide motivation for the limitations of Claim 1. Nayama et al. does not make up for the deficiencies of Davis and Matsumoto et al. Instead, Nayama et al. discloses an electron gun comprising a cathode and a waveguide to guide a laser onto the cathode to heat the cathode. This is not the same as the electron source of Claim 1. Nayama et al. does not teach a cathode comprising a beam receiving portion and an electron emitting portion, the beam receiving portion having a substantially concave or conical surface and the electron emitting portion having a tapered tip.

Thus Davis, Matsumoto et al., and Nayama et al. do not disclose all the limitations of Claim 1. Furthermore, it would not be obvious to arrive at the electron source of claim 1 from these references. Davis, Matsumoto et al., and Nayama et al. do not teach

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or provide motivation for having a cathode comprising a beam receiving portion having a substantially concave or conical surface and an electron emitting portion having a tapered tip. Furthermore, Davis teaches away from a cathode having an electron emitting portion comprising a tapered tip by disclosing "the cathode 220 of the present invention is specifically designed to improve efficiency by increasing the electron emission area of the cathode" (column 7, lines 47-50). Additionally, neither Matsumoto et al. or Nayama et al. teaches or provides motivation for a cathode comprising a beam receiving portion having substantially concave or conical surface and an electron emitting portion having a tapered tip.

**Rejection of Claim 22 under 35 USC 103(a)**

The Examiner rejected Claim 22 under 35 USC 103(a) as being unpatentable over Davis in view of Nayama et al.

**Claim 19**

Claim 19 is patentable over Davis in view of Nayama et al. because none of these references teach a method of generating electrons comprising, inter alia, "(a) negatively biasing the cathode relative to the anode to generate a localized electric field at the tapered tip of the electron emitting portion of the cathode; and (b) heating the cathode by directing an electromagnetic radiation beam onto the substantially concave or substantially conical surface of the beam receiving portion of the cathode" as recited in the claim as amended.

Claim 19 is patentable over Davis as discussed above in regards to the 35 USC 102(b) rejection of Claim 19. Nayama et al. does not make up for the deficiencies of Davis. Instead, Nayama et al. discloses an electron gun in which a waveguide is used to guide a laser onto a cathode to heat the cathode. This is not the same as the method of generating electrons of Claim 19. Nayama et al. does not teach negatively biasing a cathode comprising an electron emitting portion having a tapered tip. Nayama et al. also does not teach generating a localized electric field at the tapered tip of the electron emitting portion.

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Thus, Davis and Nayama et al. do not teach all the limitations of Claim 19. Furthermore, it would not be obvious to arrive at the method of generating electrons of Claim 19 from the combination of Davis and Nayama et al. Davis and Nayama et al. do not teach or provide motivation to negatively bias the cathode comprising an electron emitting portion having a tapered tip to generate a localized electric field at the tapered tip. Thus, Claim 19, and those claims dependent therefrom, are patentable over Davis in view of Nayama et al.

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### CONCLUSION


The above-discussed amendments and remarks are believed to place the present application in condition for allowance. Should the Examiner have any questions regarding the above remarks, the Examiner is requested to telephone Applicant's representative at the number listed below.

Respectfully submitted,

JANAH & ASSOCIATES, P.C.

Date: July 2, 2004

By:

  
Ashok K. Janah  
Reg. No. 37,487

Please direct all telephone calls to:

Ashok K. Janah  
(415) 538-1555

Please continue to send correspondence to:

APPLIED MATERIALS, INC.  
Patent Department, M/S 2061  
P.O. Box 450A  
Santa Clara, California 95052